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The Chemical Society, the Society of Chemical Industry, the Association of British Chemical Manufacturers, the Institute of Chemistry, the Society of Public Analysts, the Faraday Society, the Institute of Brewing, the Society of Dyers and Colourists, the Society of Glass Technology, the Iron and Steel Institute, the Ceramic Society, the Institution of Gas Engineers, the Society of Leather Trade Chemists, the Royal Photographic Society, the Mineralogical Society, the Biochemical Society, the Oil and Colour Chemists' Association, the Institute of Metals and the Royal Agricultural Society.

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EDITORIAL

A Fertilizer Complex

THE names of the more common fertilizers are by now part and parcel of the farmer's vocabulary, even though he may be sometimes still given to regard them as new-fangled materials attempting to oust farm-yard manure from the honourable place it has always held in the industry of crop production. "Fertilizers" however is a description the farmer has no great liking for: more often than not he calls them artificial manures, or merely artificials, as if the compounds supplying nitrogen, phosphoric acid, and potash in relatively concentrated forms are less efficient substitutes for organic manures, whereas both forms of manure serve their separate purposes. A term too, that is much favoured in our agricultural colleges and some text-books is "minerals," although there would seem to be no justification for its application to some fertilizers used to-day. In sheering away from that which seems technical, the farmer still clings to "muriate of potash," and with regard to some phosphates is brief to the point of abruptness. The farmer has enough to keep him occupied nowadays, and it is perhaps too much to expect him to give more than a passing thought to the terminology of fertilizers. Nevertheless we are tempted to wonder if a state of confusion may not result at a not far distant date if compound fertilizers should come into general use with no endeavour to give them rational names. Twenty, or even ten, years ago you could count on the fingers of your hands the fertilizers in general use; but during the last few years considerable work has been going on, stimulated by the desire for reduction of production costs, and also by some keen competition amongst fertilizer manufacturers, and a host of new fertilizers is becoming available if the farmer chooses to use them. In this country they have made little headway, partly because no propaganda has been carried out on their behalf, and partly also because of the farmer's rooted disinclination to change from well-tried materials to those whose potentialities he does not know, a conservatism incidentally which is by no means to be condemned where agriculture is concerned. But if one looks around it is not hard to find a dozen or more fertilizers produced on a commercial scale that by their elimination of much of the useless carrier material contained in the older fertilizers are obviously possessed of considerable merit; he would be a conservative agriculturist indeed who would not grant that in years to come these compound fertilizers may well supersede those now in use, as indeed they have done in parts of America and the Continent. The German Nitrophoskas, in which ammonium phosphate, ammonium nitrate or urea, and potassium sulphate or chloride are mixed to give various ratios of $N:P_2O_5:K_2O$, are by now well-known. Imperial Chemical Industries Ltd. in this country is marketing a similar range of concentrated fertilizers, and Nitro-Chalk, a mixture of ammonium nitrate and calcium carbonate, is making fresh headway each year. The annual production of the American Cyanamid Co.'s Ammo-Phos has reached hundred of thousands of tons. There are many others, of which we can think of Ammonitre, Phosphazote, Potazote, Ammoniated Superphosphate, Leunaphos, Leunasalpetre, Kalisalpetre, Ammophoska, Nitropotasse, and Superam, and patents for similar new combinations of the three essential plant-foods are being taken out with great persistency. Can their description by means of proprietary names continue for any great length of time? We are already reaching the point when the possible combinations of am, nit, azote, sup, phos, kali, and ka will have been used up, and the manufacturers of new products will have to devise a new method of nomenclature. The problem is a difficult one. One possible solution, we suggest, might be to give the name of "N.P.K. Manure," with the ratio of nitrogen : phosphoric acid : potash, to any fertilizer supplying all three plant-foods. With such a system, Nitrophoska "Rot" would become "N.P.K. Manure—15 : 30 : 15," and Ammophoska III would be "N.P.K. Manure 10 : 30 : 10." Such a system would not differentiate between ammoniacal and nitrate nitrogen, or between tri-calcic phosphate and a water-soluble form: but it has the merit at least of a comparative basis, and without this the man who has only a little knowledge of fertilizers may in a few years be completely at sea.

ANNUAL GENERAL MEETING

NEWCASTLE, JULY 10—14, 1933

About 280 members and visitors attended the fifty-second Annual Meeting of the Society of Chemical Industry, which was held at Newcastle-on-Tyne from July 10 to 14. The proceedings were conducted by Dr. R. H. Pickard, F.R.S., whose period of office as President terminated at the close of the annual meeting.

On Monday, July 10, an informal reception was held in King's Hall at Armstrong College, an account of which was given in last week's issue.

Tuesday, July 11

Civic Reception

Assembling in King's Hall on Tuesday morning, July 11, the members and visitors were accorded a hearty welcome by the Lord Mayor of Newcastle and the Principal of Armstrong College.

The Lord Mayor (Dr. J. W. Leech, M.D., M.P., etc.) assured the members and visitors that it was a great pleasure to receive them and to bid them welcome, and to wish them success in their deliberations. It was appropriate that the Society, which had last visited Newcastle in 1920, should come again, for men of the Newcastle area had played a not inconsiderable part in the progress of science during recent years. They were men gifted with that genius which had been the means of uplifting the people, and the results of their researches had advanced civilization and had benefited mankind. He mentioned as examples the names of Armstrong, Stephenson, Swan, and Parsons. There were others, still living, who were delving into the depths of nature to evolve the secrets placed there by Providence, and Providence had gifted them with that particular endowment of research. During recent years extraordinary advances had been made in all sciences and through the instrumentality of societies such as the Society of Chemical Industry.

After congratulating Dr. Pickard upon the success with which he had presided over the destinies of the Society during the past year, the Lord Mayor congratulated his old friend, Dr. J. T. Dunn of Newcastle, the President-Elect of the Society. Dr. Dunn was one of the first students of the old College of Physical Science, which was the predecessor of the present Armstrong College, where he had also served for some years as a demonstrator of chemistry. From that time onwards he had played a most conspicuous part in scientific development and research. He was analytical chemist to the Newcastle and Gateshead Corporations, and held innumerable other offices. The Society was to be congratulated heartily upon having elected to the office of president a man who by virtue of his past life and experience was so well able to carry the load of that office. He was taking upon himself a great trust and a great responsibility ; he could carry it !

Sir William Marris, K.C.S.I., K.C.I.E., etc. (Principal of Armstrong College) said that both as a representative of Durham University and the Principal of Armstrong College, he was glad to have the opportunity of expressin a welcome to the Society. It was a great pleasure t know that the Society had come to the College for i meetings, for the College had always maintained a v r close interest in and had done much work in tho regions in which the Society was interested. It had large and flourishing Department of Chemistry, and th Department and the College had always maintaine very cordial relations with industrial enterprises in th Newcastle area, and had received very great assistan and encouragement from industrial firms in the neig bourhood, which he desired very gratefully to acknow ledge. He believed that industry, too, would be read to say that the College, in its long record, had done goo service.

In a tribute to Dr. Dunn, the Principal recalled that h was one of the oldest graduates of Durham Universit and had pursued in the College the beginnings of hi long scientific career. As a member of council of th College and a member of many of its committees, he ha given advice of immense value on many difficult matters he had the interests of the College deeply at heart, an had worked hard for it. It was a peculiar pleasure therefore, to take part in expressing a welcome to th Society in a year when Dr. Dunn was about to assume th presidential office.

Dr. Pickard, proposing a vote of thanks to the Lor Mayor and Sir William Marris, said the members wer indeed gratified by the reception accorded them. The were not surprised by the warmth of the welcome, fo they were familiar with the records of previous successfu meetings in Newcastle. He recalled with great pleasur the services rendered to the profession of chemistry and to chemical industry at large by Prof. Bedson, who wa previously Professor of Chemistry at Armstrong College and he expressed best wishes to Prof. Clemo, who now occupies the Chair of Chemistry there.

Dr. R. H. Pickard then delivered his Presidential Address on "The Industrial Use of Textiles," which was published in last week's Transactions.

Luncheon

Those attending the meeting were invited to luncheon at the Grand Assembly Rooms, Barras Bridge, Newcastle, by the Newcastle Section of the Society.

Dr. Clemo (Chairman of the Section) presided.

It was announced that the following telegram had been forwarded to His Majesty the King: "May it please Your Majesty, the members of the Society of Chemical Industry, assembled in Newcastle-upon-Tyne in annual meeting, desire to re-affirm their loyalty to their Royal Patron and humbly to express their hope for his continued good health."

The loyal toast having been honoured Dr. Pickard proposed the toast of the Newcastle Section, its Officers and Committee, and thanked them for their kind hospitality. The Newcastle Section, he said, had

..ays been one of the most vigorous sections ; it prided ..lf that when its predecessor, the old Newcastle ..emical Society, had joined the S.C.I. it had doubled .. membership of the latter. However, it had main-..ned the reputation of its predecessor. Dr. Pickard ..pled with the toast the name of Prof. Clemo.

Prof. Clemo in his response said that the Newcastle ..tion was proud of its record, and was particularly ..ased that its most active member had been elected ..sident of the Society. Dr. Dunn was a pioneer of ..operation, and one looked forward to striking results ..m his efforts in the near future.

Prof. Clemo paid a tribute to Mr. Craggs and Dr. ..phenson for having done the lion's share of the work .. the local committee in connexion with the annual ..eting, and he thanked the many firms who had so ..dily offered help and hospitality to the Society during .. period of the meeting, in spite of the very difficult ..ustrial situation.

Inasmuch as he was not a Northerner, he would not ..m that during the meeting the members of the Society ..uld be shown all the seven wonders of the world, but ..y would see two remarkable things, both of which ..re established by reason of the necessity of keeping .. wolf from the door. One was the Roman wall, and .. other was the great works at Billingham. The ..phecy of famine in 1931 or 1932 had been falsified, ..gely by the work at Billingham.

The local committee, he concluded, was amply ..varded for its efforts by the fact that the meeting was ..ended by so many distinguished people.

Mr. Rudge, representing the executive committee of .. South Wales Section, invited the Society to hold its ..nual meeting next year in South Wales, with Cardiff .. headquarters. The South Wales Section, though the ..by of the Society's sections, would make up for its ..torical deficiencies by the warmth of its welcome.

Dr. Pickard, on behalf of the Society, gratefully ..epted the invitation and assured Mr. Rudge that ..by though the South Wales Section might be, there .. no misapprehension as to its lustiness.

The opportunity was taken by Prof. Clemo to present .. Dr. Dunn, on behalf of the Newcastle Section and ..er friends, a token of their appreciation of him. It ..k the form of a barometer. Prof. Clemo added that .. had never met a more genuine man than Dr. Dunn, .. of whose friends derived intense pleasure from his ..ction to the presidency. They wished him a very ..osperous year, and hoped that at the end of it he and .. Dunn would be able to say that it was the happiest ..ar of a very happy life.

Dr. Dunn in his reply said the Newcastle Section had ..en part of his life, and he hoped it would be for many ..ars to come.

The presentation of a bouquet was made by Mrs. ..nn, on behalf of the Section, to Mrs. Clemo, who in ..epting it briefly expressed her thanks.

Chemical Engineering Group Session

In the afternoon a session was held at Armstrong ..llege under the auspices of the Chemical Engineering ..oup of the Society at which a paper on " The Application to the Battersea Power Station of Researches into the Elimination of Noxious Constituents from Flue Gases and the Treatment of Resulting Effluents " was presented by Dr. S. L. Pearce, C.B.E. (Engineer-in-Chief to the London Power Co.), Mr. G. H. Hewson, Mr. A. Pollitt, and Mr. R. L. Rees, the paper being read by Dr. Pearce. Mr. J. Arthur Reavell (Chairman of the Chemical Engineering Group) presided.

In the introduction of the paper, Dr. Pearce said that the statutory consent to the erection of the Battersea Power Station was granted in 1927 by the London Power Co. Ltd., subject to conditions which required in effect the suppression of smoke, the removal of dust, and the elimination of oxides of sulphur from the flue gases. The last-named requirement presented a new and serious problem. The purpose of the paper was to outline the researches undertaken to find a practical solution of the problem and to describe the system adopted and plant installed at Battersea, which was the first power station to be so equipped.

The rate of flow of flue gas from the Battersea station when completed would be of the order of 1,500,000 cb. ft. per min., at N.T.P. The initial concentration of sulphur dioxide in the gas would lie between 0·02% and 0·05% by volume, and it would be possible to reduce this by about 90%—95% before discharging the gas to atmosphere.

There were three possible methods of reducing the amount of sulphur oxides contained in flue gas: (1) treatment of the coal; (2) dry treatment of the gas; (3) wet treatment of the gas. Dr. Pearce discussed in detail each of these methods, and described the experimental work which had been undertaken, leading to the development of a process of removing oxides from flue gases in which the gas from coal containing about 1% of sulphur was washed with water during its passage through scrubbers in which both the gas and water were brought into contact with iron oxide. The gas was then scrubbed, preferably in contraflow, with water in another chamber, the scrubbers being made of an inert material such as wood. After passing upwards through the water sprays, the gas entered a final scrubber which was wetted with an alkaline solution, *e.g.*, 0·25% chalk slurry. The gas was then discharged to atmosphere after passing through a dry scrubber to remove entrained moisture. The alkaline solution flowed downwards and mingled with the water from the water sprays.

If the gas were at N.T.P. and the washer quite empty, the gas would take abont 30 to 35 sec. to pass through the washer. About 20 tons of water and 10—12 lb. of lime or chalk were used per ton of coal burned, at a cost, for pumping and alkali, of about 3d. per ton of coal. In this way about 90% of the oxides of sulphur would be removed from gas derived from coal containing 0·8% to 1·0% sulphur.

Entrained air bubbles were produced in the wash water supplied to the steel filing by brisk aeration, and the effluent from the whole plant was also aerated to oxidize sulphites. The total reducing power of the effluent would thus be made equivalent to as little as 3 grains of sulphur per gal., in the form of sulphite. A very small amount of manganese in solution would

promote oxidation still further. After filtration, the effluent was diluted with about 25 times its bulk of return condensing water which was sufficiently alkaline to neutralize the acidity of the effluent. Dr. Pearce also outlined the results obtained by re-circulating alkaline solutions through the washer and the more important methods of analysis involved in the investigation.

He then described the gas-washing plant at the Battersea Power Station, the first half of the station consisting of nine boilers, the first six of which each had a maximum continuous rating of 312,000 lb. per hour. Each boiler was equipped with four induced-draught fans of 25% capacity, which operated in parallel and discharged into a main flue. There would therefore be a row of 36 induced-draught fans on the fan floor all discharging into the main flue when the present scheme was completed.

The coal consumption of each boiler unit was 19 tons per hour and the plant had been designed on the maximum running condition comprising seven units steaming at this rating, *i.e.*, a coal consumption of 133 tons per hour. On the basis of 13% CO_2 in the flue gases at the fans and normal fuel, the total weight of gas is approximately 3,600,000 lb. per hour.

The arrangement of the plant and the materials used in its construction were then described in detail, and Dr. Pearce concluded with a review of the outstanding problems involved in the removal of oxides of sulphur.

Mr. A. T. King then read a paper on "The Fading of Dyed Fabrics under the Influence of Sulphur Gases in the Atmosphere." For general purposes, he said, a user would naturally infer that even a dye only moderately resistant to the drastic stoving test (as recommended by the Fastness Commission of the German Chemical Society) would be reasonably safe against the relatively mild action to be expected from slight atmospheric contamination from coal burning or other adventitious causes of contact with sulphur dioxide. The reverse was the case with certain classes of dye, however, particularly those with azonaphtholic groups, and conditions frequently obtained, involving relatively small quantities of sulphur dioxide, under which dyes especially selected to withstand the drastic stoving test were turned completely off-shade, even more so than many dyes of relatively poor fastness to stoving. He sketched briefly the chemical aspects of the problem, to show how and when dyed fabric was affected by exposure to traces of sulphur dioxide. Any steps towards elimination of sulphur dioxide from the atmosphere, he concluded, would make for more lasting freshness of colour on textile fabrics.

The papers read by Dr. Pearce and Mr. King will be published in full by the Group at a later date.

In the discussion which followed, Mr. G. Monhebel congratulated Dr. Pearce and his colleagues on their courage in tackling, on such a huge scale, a problem about which little was known when they started. They were getting down to traces of sulphur dioxide, which were scarcely detectable by smell. Many would be perplexed if they had to scrub out over 90% of a constituent occupying less than 0·05% by volume from 1,500,000 cb. ft. of gas per min.

Mr. Monhebel then gave an account of some work carried out by Imperial Chemical Industries, Ltd., at Billingham in conjunction with Messrs. Howden & Co. During recent years they had carried out extensive researches on the theory of absorption and the efficiencies of various forms of packing. They could correlate the various types of packing with a straight falling film absorption tower, and as a result could practically design a full-scale tower from the results of laboratory experiments using a glass tower down which a film-scrubbing liquid was falling. They had found that sprays were not efficient for absorption. The reason was that the liquid in the drops, once they were formed, was practically quiescent, and consequently absorption was dependent on the diffusion of the dissolved gas from the surface to the interior of the drop. This was true particularly for the absorption of relatively insoluble gases, where the limiting factor was the water film and not the rate of diffusion of the gas up to the liquid. Consequently, a scrubber should always possess two characteristics:—(1) means of bringing the gas by turbulence up to the liquid, (2) means of thorough mixing and turbulence of the liquid as it descended from the scrubber.

These characteristics were obtained by allowing the liquid to fall in films over a closely-packed lattice type of packing.

He illustrated a corrugated plate type of deduster which I.C.I., Ltd. had devised and patented, and which had been applied experimentally to Brimsdown power station. The sulphur elimination was 70%—80%. A greater degree of sulphur elimination with this corrugated plate type of deduster could have been obtained by increasing the size of the plant, but as this would then become relatively large and expensive, it was considered that final desulphurization of dedusted gas could be better obtained in a grid packed tower. Simple laboratory experiments showed that 98% SO_2 absorption was to be expected with a 5 ft. depth of ¾ in. pitch packing with a gas speed of 7 ft./sec., provided the water was always kept slightly alkaline. As it was decided to market plant for dedusting and sulphur elimination from boiler flue gases, a smaller commercial size scrubber of cross-section 4 ft. × 4 ft. was erected at Billingham, taking part of the gas from the flue after one of the dedusters. The water was re-circulated, but with a small continuous purge, and was maintained at 120° F. in order to simulate conditions that would be obtained on the full scale. The plant had completely justified the laboratory researches. The efficiency of sulphur removal was just over 98% when firing coal containing from 2% to 3% sulphur. Using gas which had been dedusted, it had been possible to reduce the purge rate. No choking with dust or scale had occurred after several hundred hours' running. The purge could be clarified and returned.

With regard to the Battersea plant, he said that if lime were added to the river water used in the final scrubber he would have expected $CaCO_3$ scaling to take place. He considered that the number of sprays (1400) in the plant constituted a real objection, as many did not appear to be accessible for cleaning when the plant

...n commission. Corrosion might be a serious difficulty in the downtake if the acidity of the liquid were allowed to reach a p_H of 3·5. The cast-iron tubes in the Billingham dedusters showed decided corrosion when the p_H of the water was 4·0. Was the semi-steel mixture mentioned in the paper appreciably more resistant to corrosion than cast iron ?

Dr. R. Lessing said that it was remarkable to observe the magnitude of this first application before any experience had been gained on smaller plant. Credit was due to the authors for their endeavour to find out as much as possible about the process while the work of designing was going on. As, however, the main lines of the engineering design were definitely adopted before the fundamental knowledge had been obtained, the plant was probably more complicated, and certainly of much larger dimensions, than it would have been if it had been laid out under more favourable conditions. He personally was associated with the process and the design of a plant in a corresponding case for a very large base load station in the London area, and the outstanding feature, apart from considerable differences in the lay-out and internal arrangement of the gas-washing plant, was on the process side. There was no difficulty, given a suitable plaut, in extracting the very small quantities of sulphur dioxide from chimney gases to the extent of 80% or even 100%, but he foresaw that if the very large plants were multiplied, and if other industrial undertakings began to extract the sulphur from combustion gases, then the effluent question would become very serious.

The costs of the process were referred to in the paper as ...d per ton of coal used. He asked if that included the cost of disposal of the filtered mud taken from the plant, and what the moisture content of the mud was likely to be with the system of filtration adopted. As to corrosion, it would be well to make it clear whether the corrosion of the varions scrubbing elements was intentional and whether they were put there for the pnrpose of supplying the iron catalyst required in the reaction. If that were so, what safety factor was assumed and what time margin was allowed before trouble arose from excessive scaling and dissolving of these scrubber sections ?

Dr. A. Crawford (Ashington Colliery), commenting on the authors' statement that the sulphur content of the coal used should be 0·8% to 1% suggested that there was not a very large stock of coal in this country with such a low sulphur content.

Dr. J. B. Firth suggested that if the effluent were put into a river of a reasonable state of purity there would be considerable trouble.

Mr. J. Sutherland asked what was included in the ...d. per ton of coal burned, representing the cost. Did it include repairs, interest, and depreciation of plant, etc. ?

Mr. Pearce, replying to the discussion, intimated that he would reply to most of the questions in writing. The Battersea station was still in its early days of operation and had had a little load on, so that any figures given at the moment would be possibly misleading, and at any rate inaccurate. Dealing with the problem of the cost of the plant, he said that the figure given in the paper as representing the cost of the lime and pumping was 3·05d. per ton of coal. The full incidence of the capital charges added no less than 10d. per ton. To these figures he added a round figure of 2d. per ton, which was considered more than ample to recover maintenance, removal of sludge, and other factors of that order, so that the figure was built up to 15d. per ton of coal as representing the cost of providing and operating the plant. This was a large figure and he had been asked why the Battersea site was selected rather than a site 15 or 20 miles down the river, as critics had urged some years ago. The answer was that the capital costs of transmitting an equivalent amount of energy to Battersea from a site 15 or 20 miles down the river amounted to about £2,500,000. The incidence of the capital charges on that outlay, the line losses, losses in the transformers, and the maintenance, would have imposed the equivalent of an additional cost on the coal of 60d. per ton. So that the difference between the 60d. for a down-river station, including the cost of transmission, and the Battersea gas washing, amounted to 3s. 9d. per ton of coal burned, or roughly £185,000 per annum. It might be argued that if a station were built 15 or 20 miles down the river, it could have been less ornate and less expensive than the Battersea station, and that gas-washing plant might have been dispensed with. But even if the station had been erected down-river and there was no gas-washing plant, and allowing that there would perhaps have been a saving of a few pence per ton on the coal the margin in favour of Battersea would be reduced from 3s. 9d. to approximately 1s. 6d. Thus there was still a margin which represented on the completed station about £75,000 per annum.

On the motion of the Chairman, a hearty vote of thanks was accorded the authors for their papers.

Civic Reception

In the evening a reception was held in the Laing Art Gallery, Higham Place, Newcastle, members of the Society and guests being received on behalf of the City Council by the Lord Mayor, Dr. J. W. Leech, M.P., and the Deputy Lady Mayoress, Mrs. Hall, supported by the Sheriff and Lady Sheriff, Alderman and Mrs. J. W. Telford. The Laing Art Gallery is a fine building, and the scene was a brilliant one as the guests were received in one of the largest rooms, that which is at present devoted to the exhibition of a loan collection of works by Dame Laura Knight, A.R.A., and Harold Knight, A.R.A.

Following the reception the guests assembled to hear an address of welcome from the Lord Mayor, who, as he had previously welcomed the members of the Society to Newcastle at the morning's annual meeting, on this occasion directed his remarks mainly to the lady guests. Dr. Pickard on behalf of the Society thanked Dr. Leech for the City's welcome. A conversazione followed, in the course of which guests were able to stroll through the several galleries of the building and to see a fine collection of works of art. Two of the galleries house permanent and loan collections of water-colour drawings arranged to illustrate the progress of the art. In the Museum Court there is also a good collection of Egyptian antiquities, pottery and porcelain,

glass, wrought ironwork, coins and medals, English costumes, and the exhibition of textile fabrics is of more than average interest.

During the evening a programme of music was given by Mr. A. W. Crosse's orchestra, and refreshments were provided in two of the galleries.

Wednesday, July 12

In reply to the telegram of loyalty and good wishes sent by the Society to H.M. the King (its Patron) on Tuesday, the following was received from His Majesty's private secretary: "The King sincerely thanks the members of the Society of Chemical Industry, assembled at Newcastle, for their loyal message."

Plastics Group Session

A meeting arranged by the Plastics Group of the Society was held on Wednesday morning in the Chemistry Lecture Theatre at Armstrong College. Mr. H. V. Potter (Chairman of the Group) presided.

Dr. Herbert Levinstein (Past-President of the Society) presented a paper in which he surveyed the subject of phenol supplies and cellulose, these being the two main raw materials for the phenolic plastics. It is hoped to publish this paper at an early date.

Presentation of Society's Medal

Later on Wednesday morning, in the King's Hall at Armstrong College, the Society's medal was presented by Dr. R. H. Pickard, the retiring President, to Prof. W. A. Bone, head of the Department of Chemical Technology at the Imperial College of Science and Technology, London. The presentation was followed by a lecture by Prof. Bone, entitled "Forty Years of Combustion Research."

The President reminded the members that the Society's Medal had been awarded at two-yearly intervals since 1896 to chemists of exceptional distinction, as selected by the Council. The list of recipients included names which were memorable in the history of chemical science and its application to industry. The first name on the list, appropriately enough, was that of John Glover, a chemist who was associated with the Newcastle district, and at the conclusion of this meeting the last name on the list for the time being would be that of Prof. Bone, who had been associated with industries which had made Newcastle famous.

In 1888, William Arthur Bone entered Owen's College, Manchester, then a constituent part of the Victoria University, with the intention of undergoing a university training in chemistry and physics which would prepare him to occupy a position in the iron and steel industry. One great factor which influenced the young student in his choice of course was his uncle, Mr. T. C. Hutchinson, a well-known Cleveland ironmaster and the managing director of the Skinningrove ironworks; and it was Prof. Bone's very close association with his uncle's enterprises which eventually caused him to make a special study of the subject of fuel technology. Since those early days he has always been deeply interested in the Skinningrove ironworks and the special problems relating to the utilization of fuel in the iron and steel industries. Leeds University in 1906 having decided to form a department of fuel technology invited Prof. Bone to organize this new development of its activities. This was the first British University to institute such a department, which, four years after its inauguration was endowed by the gas industry in memory of Sir George Livesey. The number of other universities and colleges which have since embodied a course of fuel technology in their curricula is a tribute to the foresight of the Senate of Leeds University in founding the Department, and to Prof. Bone for his clear conception of the requirements of this subject and for establishing it upon sound principles.

Between 1904 and 1908 Prof. Bone, in conjunction with Prof. R. V. Wheeler, made an experimental investigation of the influence of steam in a gas producer. This was the first series of experiments of this nature to be carried out on large-scale plants, and the results were published in the Journal of the Iron and Steel Institute between 1906 and 1908. In conjunction with the late Mr. C. D. McCourt, Prof. Bone carried out a series of researches into the subject of surface combustion, which researches extended from 1908 to 1912. As a result of this work, incandescent surface combustion was made applicable to diaphragm heaters, steam raising in boilers, and for furnace work in general. Boilers were designed and constructed in which incandescent surface combustion was employed and resulted in these boilers having very high efficiencies. All problems relating to the efficient use of gas had a magnetic attraction for him, and so, whilst at Leeds University, he began the first scientific investigation upon gas fires. During all this time he had never lost his interest in the Skinningrove ironworks, and so we find him between 1908 and 1918 collaborating with his uncle, Mr. T. C. Hutchinson, upon the problem of the ideal fuel consumption in works of this kind. This was a very large undertaking, since it involved the proper co-ordination of coke ovens, blast furnaces, steel furnaces, as well as furnaces for the rolling mills in one site, and arranging for the full utilization of all the surplus gases from both the coke ovens and the blast furnaces. The results justified the thought and labour involved, because uncle and nephew were able to show that with a properly co-ordinated plant, one ton of finished steel sections could be produced from Cleveland iron ore with a consumption of not more than 1·6 tons of Durham coal.

In 1912 Leeds suffered and London gained, for Prof. Bone was appointed head of the Department of Chemical Technology at the Imperial College of Science and Technology in London. Since its inception this department, which includes fuel technology, chemical engineering, electrotechnics, and refractory materials, has continued to attract men from all over the world to its courses, it has developed a high pressure laboratory which is well known in both scientific and industrial circles, whilst cordial relationships have been established with some of the largest industrial concerns in this country. For the last eight years, Prof. Bone has been directing, on behalf of the Federation of Iron and Steel Manufacturers, a systematic investigation into blast-furnace reactions. This is a development of Lowthian Bell's classical work on this subject carried out over sixty years ago. His deep and abiding interest in the

industrial application of his subject is emphasized by the fact that from 1915 to 1922 he was Chairman of the British Association Fuel Economy Committee, from 1916 to 1919 a member of the Coal Conservation Committee, and from 1917 to 1920 consultant to the Fuel Research Board. The scientific world of recent years had been particularly interested in, and admired particularly, the work that he had done in more fundamental scientific aspects of combustion. Since 1922 he had been directing and organizing researches upon the chemical constitution of coals, with special reference to the maturing and developing of their coking properties and benzonoid characteristics. The magnificence of the technique and the way in which these researches had been described had filled the whole scientific world with very great admiration.

His work in the field of high pressure had resulted in (a) the discovery of N_2 activation and consequent NO formation in $CO—O_2—N_2$ explosions at high pressures: (b) the synthetic production of alcohols, aldehydes, etc., and the slow oxidation of hydrocarbons under high pressure; (c) equilibrium in $CO—H_2—CH_3OH$ etc., systems at high pressures. Another important aspect of his research work has been the investigation of the phenomenon of spin in gaseous detonations and the influence of strong electro-magnetic fields thereon.

From among the many publications he has made upon scientific subjects, mention may be made of his three books, namely, "Coal and its Scientific Uses," published in 1917, "Flame Combustion in Gases," 1927, and "Gaseous Combustions at High Pressures," 1929.

Other biographical details and a photograph of Prof. Bone were published in CHEMISTRY AND INDUSTRY on Feb. 5, 1932, p. 114.

The Medal was then presented, amid prolonged applause.

Prof. Bone said that he felt deeply sensitive of the honour which the Society had conferred upon him by the award of its Medal. It was difficult to find words to express his feelings, but he hoped that in the course of the Address he was about to inflict it would be realized that there must come to him and to his colleagues at South Kensington and to those who had worked with him in other places a deep sense of satisfaction that their work had thus been appreciated by a Society which was devoted to the applications of chemistry to industry.

Prof. Bone then delivered his address, which was published in last week's Transactions.

Mr. W. H. Cadman, proposing a vote of thanks to Prof. Bone for his address, said that those who had witnessed Prof. Bone's experimental demonstrations at the Royal Society, the Royal Institution, or the Royal Society of Arts, and who had heard the views and theories he had put forward, could not but have been convinced of the accuracy of those theories and views, which demonstrated that chemical science, to be of real value, must be based on accurate and sound experimentation. No one had done more to help chemists in regard to gas analysis than had Prof. Bone. In this connexion one need only mention two things, *i.e.*, the Bone and Wheeler gas analysis apparatus and the wonderful technique which Prof. Bone and his colleagues had developed for the photographing of the mechanism of combustion, particularly in the explosive range. He had given a great deal of attention to the subject of coal and its utilization, and was a firm believer that in the not far distant future it would be possible to use pulverized coal, de-ashed, as a fuel for internal combustion engines of the Diesel type.

Dr. J. T. Dunn, seconding the vote of thanks, recalled that he had known Prof. Bone for practically 40 years. At one time, at the Battersea Polytechnic, Prof. Bone complained that he had not enough money in which to prosecute research. Since that time he had had a good deal of money—though one doubted that he had considered it sufficient—and it would be agreed that the expenditure had been abundantly justified by the results which had been given in the interesting and fascinating address he had delivered.

The vote of thanks was carried with acclamation, and Dr. Pickard presented to Prof. Bone, on behalf of the Newcastle Committee and as a memento of the occasion, a specially-bound copy of the handbook which had been distributed at the meeting. Prof. Bone briefly responded.

ANNUAL DINNER

The company at the fifty-second annual dinner of the Society, which was held at the New Assembly Rooms, Barras Bridge, over which Dr. R. H. Pickard, the retiring President, presided, included many distinguished members and guests. Among them were the Rt. Hon. the Lord Mayor of Newcastle (Dr. J. W. Leech, M.D., M.P., etc.) and the Lady Mayoress; the Sheriff of Newcastle and the Lady Sheriff; Prof. H. E. Armstrong; Prof. W. A. Bone; Dr. F. H. Carr (Past-President); Prof. G. R. Clemo (Chairman, Newcastle Section) and Mrs. Clemo; Dr. R. T. Colgate (Hon. Treasurer) and Mrs. Colgate; Dr. J. T. Dunn (the newly-elected President) and Mrs. Dunn; Sir Henry Fowler (President, Institute of Metals); Mr. Noel Heaton (Past President, Oil and Colour Chemists' Association) and Mrs. Heaton; Dr. H. Levinstein (Past-President) and Mrs. Levinstein; Sir William Marris (Principal of Armstrong College, Newcastle); Prof. G. T. Morgan (President of the Chemical Society, and Past-President of the Society of Chemical Industry); Mrs. Pickard; Mr. F. P. Tarratt (President, Institution of Gas Engineers) and Mrs. Tarratt; Prof. J. F. Thorpe (President, Institute of Chemistry); and Mr. L. E. Westman (Editor, *Canadian Chemistry and Metallurgy*).

The loyal toast having been honoured, Sir Henry Fowler, K.B.E. (President, Institute of Metals, and late Chief Mechanical Engineer to the London, Midland & Scottish Railway) proposed "Chemistry in Industry." He emphasized the debt which all industrialists owed to chemistry, though he confessed that even now he could appreciate only a little of the great connexion between chemistry and industry, and that one could not tell definitely where chemistry began and ended. Naturally he commented upon the great achievements which chemistry had made possible in metallurgy and in railway work, and upon one or two matters in regard to which it was of particular importance in railway work. Most of the railways, he said, were served by chemists, who were always honoured and respected, often because

others did not understand fully what those chemists did. When a new source of water was found one had to appeal to the chemist in order to find out whether or not it was suitable for the purpose to which it was to be applied. Again, the services of the chemist were of the utmost importance in connexion with matters of lubrication. One of the greatest advances in connexion with railway locomotives in this country concerned the use of superheated steam. At first it could not be used because there was not available a lubricant which would enable the bearings to be kept moving when superheated steam was used. Indeed, one could not hope to do more on an occasion such as this than to touch the fringe of matters in respect of which industry was indebted to chemistry.

In coupling with the toast the name of Dr. Pickard, Sir Henry felt more intimately connected with him than perhaps Dr. Pickard was aware, for both had had the honour of being students of the late Sir William Tilden. Sir Henry said that no one had done more to foster the relations between chemistry and industry than had Dr. Pickard: therefore, it was an honour indeed to be asked to propose the toast of "Chemistry in Industry" and to couple with it Dr. Pickard's name.

In his response Dr. Pickard discussed some of the work of the Society, and said, in the first place, that it was not concerned merely with the manufacture of chemicals. During the war and since there had been a much more universal recognition of the part which chemistry played in our national life; its importance was becoming more and more recognized by that hypothetical individual, the "man in the street," and even to the ladies chemistry must seem to be a very important subject: those attending this function, and who were wearing chemical rather than natural products, realized that chemistry was playing an important part in their lives.

The Society did not confine its attention to the application of chemistry merely to one branch of industry. Its JOURNAL, of which the Society was extremely proud, contained numerous sections devoted to the application of science to some special branches of chemistry, and it played a very important part in the industrial life of the country. It was, he believed, the only journal which attempted, and successfully attempted, to keep chemists employed in different branches of industry up to date with their subjects, and it was supported entirely by the Society; up to the present it received very little support from industry itself, but the Society looked forward to the day when it might perhaps, with a re-organized profession of chemistry, see industry as a whole sharing the burden of the publication of new knowledge, which burden at the moment was borne entirely by the professional chemist. There were very few professions such as this, the members of which were nearly all employees who were expected to support the work of acquiring new knowledge, and having acquired it to pay the cost of its publication and dissemination among their professional brethren. At the last annual meeting of the Society at Nottingham Prof. Morgan (then President) had referred to the reorganization of the chemical societies; and there was a scheme on foot for reorganizing them in such a way that they could work more closely togethe improve their publications, and spread the cost o publications more equitably.

In spite of this hint of complaint about the cost c publications, however, the President assured th members that the Society was in a flourishing conditio financially and otherwise. Perhaps ordinary membe would think that being so it was time the amount of th subscription was reduced. He hoped, however, tha the Council would not reduce subscriptions as a firs step but would first do all that could be done to improv the publications; that could not be done without fund

Finally, he said it would be realized that the applica tion of chemistry to industry depended in the long ru on the prosecution of further research by the chemists That being so, the Society was destined to play leading part in further advances.

Dr. L. H. Lampitt (Chairman of the Food Group c the Society) proposed the toast of the guests. Firs among the guests whom he mentioned particularly wer the Lord Mayor and Lady Mayoress, and the Sheri and Lady Sheriff, and he expressed indebtedness to ther for having found time, in the midst of their multitud nous duties, to grace the Society's board on this occasio That in itself was sufficient to warrant a toast to them another reason, however, was that they represented th great district of Newcastle. The doyen of Englis chemistry, Prof. H. E. Armstrong, was also heartil welcomed. Many of those present, said Dr. Lampitt had squirmed under Prof. Armstrong's vitriolic attacks They never knew, on those occasions, whether he wa talking with his hand on his heart or with his tongu in his cheek, and perhaps he himself did not know But his words did inspire them to do bigger things, an therefore they all welcomed him.

Of the representatives of kindred societies, Dr. Lampit mentioned Prof. Thorpe (President of the Institute o Chemistry) and Prof. Morgan (President of the Chemica Society), from whom much was expected, in conjunctio with the President of the Society of Chemical Industry in regard to reform. One heard of committees bein formed, knocked down, re-formed, and knocked dow again. It had been said that chemists in the province were becoming restive; there were many others wh were becoming restive also and who wanted somethin done. They did not want talk but action, and the were looking to such men as Prof. Thorpe and Prof Morgan for action in the near future.

Then the Society was glad to welcome many industrialists. Industry, to a certain extent, was providin the sinews of war and without the sinews of war the work could not go on. It was often said that the man wh paid the piper called the tune. Let industry be quit sure however, that it was not going to call the tune although it might pay the piper; if industry were to pay the piper and call the tune, then the chemists were not worthy to be in the picture. The latter were the people who could discern and must decide the tune to be played.

Finally Dr. Lampitt extended a warm welcome to Mr Westman (the editor of *Canadian Chemistry an Metallurgy*) as a representative of the Press an

also as a representative of a vast number of the Society's members overseas.

He coupled with the toast the names of the Lord Mayor, Prof. Armstrong, and Mr. Westman.

The Lord Mayor of Newcastle, who was the first of the speakers to respond to the toast, expressed appreciation of the hospitality extended to himself, the Lady Mayoress, the Sheriff and the Lady Sheriff, and assured the members of the Society, on behalf of the City Council, that it was indeed a great pleasure to receive them in Newcastle. They, being men of ingenious minds and being concerned with research, could help to solve some of our problems. Speaking of unemployment, he said that perhaps the North-East Coast and the South Wales areas were the two most distressed in the country, and he knew of no association or body of friends more likely to help in solving that problem than the Society of Chemical Industry, whose members were concerned always with research; it was their duty, by virtue of their specific endowments, to introduce new industries. Commenting on a statement made during the previous day, that the application of science was to some extent a cause of unemployment by introducing machinery to displace labour, he emphasized that whilst on the one hand labour might have been displaced, on the other hand science had created new industries which employed labour.

Unemployment had been rife on the North-East Coast, but happily, during the last twelve months the figures had been reduced by something like half a million; he believed there was a reduction of about 200,000 during the last month, as shown by the figures of the Ministry of Labour. He was of the opinion that we were at the dawn of a great revival; the re-building of our country had already begun. On the North-East Coast, there was a glorious trinity of industries—coal, shipbuilding, and steel—and he was happy to say that, according to published statistics things were improving. Shipyards which had been idle for so long were beginning to work, and many orders had been received on the Tyne and on the Clyde. Much remained to be done yet by way of draughtsmanship, and so on, so that we could look forward to the absorption of more of our unemployed workmen in the near future.

The Lord Mayor also commented upon the courage of the unemployed, and said that the spirit of to-day was as good as that of 100 years ago, as reflected by the words of Emerson, who had said that he had known England in her hour of trial and affliction but had found her young and vigorous, determined to win through in spite of vicissitudes. Britishers, he concluded, knew no failure and no defeat.

Prof. Armstrong commented upon the marvellous picture of progress presented by the modern ironclad as compared with the old "Warrior," the first of the Tyne armour-plated-shipbuilding industry, which he had seen in 1864. He drew attention to the work that had been put into the development of an ironclad Navy, to the enormous impetus that that work had given to the application of science to industry; but, he added, we had not spent a half-penny on ourselves in using science in our own development, and we were suffering from that to-day. We had developed the machine at the expense of the man, and on occasions such as this every opportunity should be taken to proclaim it to the public, in simple terms, and in some way force them to listen. We must turn the whole force of scientific endeavour on to ourselves and raise our intelligence to the point of being able to apply it to ourselves. Those who could read the words uttered at the World Economic Conference must have felt that the position was deplorable. There was no sign of intelligence, no sign of real understanding of what was going on in the world, and the terrific force that had been exercised through the application of science to industry. The world had no sense of measurement in its mind, it could not settle; it had no standard of money, no standard of morals, and no standard of intelligence.

In a tribute to Prof. Bone, he said he was a descendant of Sir Lowthian Bell and almost the only man who, since Sir Lowthian Bell, had done anything to develop systematically the science of the iron and steel and fuel industries. Therefore Prof. Armstrong congratulated the Society upon having presented its Medal to Prof. Bone. One was particularly glad to attend the meeting and to help to pay him a well-deserved compliment.

Prof. Armstrong also paid a tribute to Dr. Dunn, the newly-elected President, who had worked hard for the Society for very many years and in a manner which had provoked the admiration of his fellows. He could not render greater service than he had rendered, and it was pleasing to see him brought into the open so that homage could be paid him.

Mr. L. E. Westman (Editor *Canadian Chemistry and Metallurgy*), who also responded to the toast, said it seemed to him that the more one travelled about the world the more evident it became that one had much in common with one's fellows. One of the problems of the overseas chemist was to know to which or to how many of the organizations existing in the United Kingdom he should owe allegiance. He suggested that chemistry was not quite keeping pace with the development of the Empire constitutionally; we had in the Empire a group of self-governing Dominions and units of people, and he urged that chemistry should follow the same lines as those relating to the constitutional co-ordination of the Empire units. It seemed that two things were essential, and they appealed to chemists overseas as much as to those in Great Britain. First, that Empire chemistry should be represented by some kind of super organization; and secondly, there was absolute necessity for maintaining as high a standard of excellence as that now obtaining, or even better, in regard to publications, all within the Empire doing their share in the publication of chemical and scientific literature.

A suggestion for co-operation between the Dominions and Great Britain was that some of the large employers in Great Britain might give graduates of Dominion universities opportunities of employment in their organizations from time to time, and *vice versa*: such an exchange of "mental property" would be a good thing for all.

Finally, Mr. Westman assured British chemists that the Canadian Sections would extend to them the right hand of comradeship whenever they visited Canada.

the agent between the producer and the consumer, finds that he cannot cover his expenses, the market price being beyond his control. In these circumstances the employer adopts the only course open to him and reduces production, and inasmuch as scarcity raises prices and abundance lowers them, the relation between supply and demand is once more adjusted. But at what expense? Reduced production means unemployment, and faced with that dilemma Labour declares that it is all the fault of the system and that Capitalism has broken down. Of course it has, but the reason for the breakdown has nothing to do with the defects of the system, but with the refusal of Labour to accept the only terms on which the system can freely work. This, however, is not the end of the story. Those who remain in employment, it is true, have achieved their objective—higher wages—but they fail to recognize that the increase is deceptive, since *ex hypothesi* prices have risen and the increased wage buys less. Not only that, but the unemployed, created by the demand for uneconomic wages, must be maintained. This burden of maintenance falls on all classes, but primarily upon Labour, since wages are incomparably the largest taxable element in the nation. There are yet further reactions to this disastrous refusal to accept the market price. If this country were a self-contained unit the position would be bad enough, but we are largely dependent upon our export trade for the wherewithal to obtain the essentials of living, and yet Labour in the pursuit of a shadow—an artificial "standard of living"—is reducing its competitive power in the neutral markets and thereby destroying its main objective.

If these conclusions are valid, it follows that we should be well advised not to follow America in her will-o'-the-wisp inflationary policy of pulling herself up by her own bootstraps. The danger of being drawn into her orbit is great, since undoubtedly American inflation would hit us in a vital spot, our export trade. Nevertheless we dare not follow America, since what may be a ripple on the shores of that continent may be a tidal wave in this country. This is due to our smaller population and our special economic conditions. All experience, let alone reason, teaches us that inflation is a drug requiring larger and larger doses, leaving the patient weaker, economically, with each injection. People talk of "controlled" inflation; it has never been witnessed yet, since inflation results in a vicious circle of ever-widening circumference. At the best, inflation is a method of confiscation of past savings and present capital, camouflaged by the hope that the victims will not notice it. We are told that we are the most highly-taxed nation in the world, that taxation is strangling industry and that "inflation" is the only way out. I doubt the "strangulation" theory and definitely dispute the remedy. That we are over-taxed is true. The country cannot afford expenditure on so-called "social services" which do not cause the growth of a blade of grass, a bushel of wheat, or the production of a single commodity which we need. In any case, to reduce the burden of taxation by inflation is a coward's policy. Inflation falls on the just and unjust alike—it shifts the burden but does not reduce it. The economic salvation of this country, and indeed of the world, lies in the recognition of the sanctity of the law of the market price. It is the root principle of our competitive economic society. Men may dream of a world order where "yearnings" and not earnings are the measure of the rewards for effort, but that stage of civilization is not yet, although our present state is partly due to our attempt to achieve it. Let us abandon dreams, and if only our leaders have the wisdom to appeal to the courage, the grit, and the common sense of the people, they will not betray their trust.

PROTECTION FOR HOME-PRODUCED MOTOR OIL

The Prime Minister announced in the House of Commons on July 17 that the Government had decided to take immediate steps to encourage the production of oil from coal in this country. Light hydrocarbon oils manufactured from coal, shale, or peat will enjoy a preference of not less than 4d. per gallon over imported oils. The proposal will come into operation on April 1, 1934, and the period during which the duration operates after April 1, 1935, will be determined by the extent of the preference. The total amount of preference has been put at 3s., and on the basis of the lowest possible preference of 4d., the duration of the guarantee will be 9 years from April 1, 1935, or 10 years in all from the commencement of the scheme. If the duty on imported oil continues at its present rate of 8d. per gallon, home-produced petrol will enjoy a preference of 8d. per gallon from April 1, 1934, until September 30, 1939.

The concession will apply to all processes, but it is of particular importance to Imperial Chemical Industries, Ltd., who have been carrying out experiments at Billingham for six years at a total cost which is stated to have been in the neighbourhood of £1,000,000.

In view of the undertaking given in the House of Commons, the directors have now authorised a scheme for the erection of a large commercial plant, which is to be located at the Company's works at Billingham-on-Tees, Co. Durham, where special facilities are available. An initial output of 100,000 tons a year of first-grade petrol is aimed at by processing 400 tons of coal a day and using altogether about 1000 tons a day of coal. The operation of the plant will give permanent direct employment to 2,500 miners and other workers, as well as much indirect employment.

The construction of the plant itself, estimated to take about 1½ years, will call for much activity in the iron and steel and heavy industries. 7000 men will find direct employment during these 1½ years, and it is expected that there will be indirect employment for a further 5000 men.

The necessary new capital of about £2,500,000 will be furnished by I.C.I. Ltd. from its own resources.

TRANSFERENCE OF RAYON SHARES

It is reported in the *Financial Times* that the French company, Société Financière Internationale de la Soie Artificielle is to acquire the whole of the rayon interests now held by the International Holding & Investments Co. By this arrangement the French company will take over large blocks of shares in some of the principal artificial-silk-producing companies in Holland, France, Spain, Austria, Czechoslovakia, and America, and will control altogether the production of about 80,000 tons, or one-third of the entire world production.

SOCIETY OF CHEMICAL INDUSTRY
OFFICIAL NOTICES

Members are reminded that this is a particularly good opportunity to bring new members into the Society at the special half-yearly subscription of £1 7s. 6d. covering the period July to December. The JOURNAL is sent only from July 1.

Annual Meeting. There are several small payments due to the Hon. Secretary, Mr. J. W. Craggs, 4, St. Nicholas Buildings, Newcastle-upon-Tyne, and as he is very anxious to clear his accounts promptly, members will assist by attending to all such details as soon as possible.

Orders will still be received for the group photo at 4s. pre-paid.

MEMBERS ELECTED
July 11, 1933

Draper, P. W., 12, Sandhill Drive, Alwoodley, Leeds.
Facer, Reginald, 41, Clarence Road, Rockdale, New South Wales. Manufacturer.
Priestley, Herbert Shaw, Thomas Hedley & Co., Ltd., Phœnix Buildings, Collingwood Street, Newcastle-on-Tyne. Chemical Superintendent.
Smith, Trevor A., c/o Leech, Neal & Co., Ltd., Spondon, Derby. Research Chemist.
Somiya, Takayuki, c/o Miss Jenkins, 97, Gower Street, W.C.1. Assistant Professor of Tokyo Imperial University.
Wilson, William Charles, Technical Dept. (Nobel Section), I.C.I., Stevenston, Ayrshire. Research Chemist.
Restored to List: F. A. Freeth, N. J. H. MacCulloch, E. C. Pickering, and N. L. Tyler.

CORRESPONDENCE
CORROSION OF METALS

SIR,—In a recent paper, Dr. Bengough and Dr. Wormwell[1] have discussed the Corrosion of Metals under conditions of unequal oxygen distribution. With much of what they say we can gladly agree: with other passages we must frankly express dissent, whilst there are again other places where further experimental work would appear necessary before a definite opinion can be formed on the views advanced.

Such experimental work is now in progress in the Cambridge University Chemical Laboratory, and is being directed to settle such problems as the following:

(1) whether the transport of oxygen through water or a salt solution is hindered by the presence of solid corrosion-products, and if so to what extent;

(2) whether the special corrosion often observed where metal rests against a foreign body, such as glass, is due to (a) differential aeration or (b) adhesion of the corrosion-product to the foreign body instead of the metal;

(3) whether the difference in the specific gravities of oxygen-free and oxygen-saturated water is sufficient to promote the circulation needed for the corrosion-process;

(4) whether oxygen, which certainly stimulates corrosion under some conditions, may, in other circumstances, prevent attack, retard it or limit it to certain areas.

Until this work is complete, we prefer to delay our reply to those points in Dr. Bengough and Dr. Wormwell's paper with which we feel compelled to differ. Our main object in asking you to publish this letter is to make it clear that our silence on the matter is not to be construed as indicating that we have no intention of replying to the points on which our friends at Teddington definitely disagree with us. But it is equally important to state that we do not reject the new Bengough-Wormwell "Film Distribution View of Corrosion," which in many respects appears to us a reasonable statement of the position, and indeed embodies several of the views which are strongly held by the Cambridge group of workers.

We are, Sir, etc.
U. R. EVANS and R. B. MEARS

Cambridge,
July 14, 1933

[1] Proc. Roy. Soc. (A), 1933, **140**, 399.

HYDROGENATION OF CHOLESTEROL

SIR,—In the absence of my colleague Mr. Hewett, may I be allowed to reply on his behalf and my own to a criticism contained in the very interesting paper by W. Schlenk, O. Bergmann, and E. Bergmann which appears in last week's issue of the JOURNAL (p. 209 T). They state: "Contrary to Cook and Hewett, we do not consider that the latter possibility" (*i.e.* the migration of a quaternary methyl group) "must be excluded *a priori*."

In our communication relating to the dehydrogenation of cholesterol (CHEMISTRY AND INDUSTRY, May 26) we did not deny the possibility of the formation of a hydrocarbon, $C_{18}H_{16}$, by migration of a quaternary methyl group. We merely stated that "we were more inclined to the view that the substance was . . . $C_{17}H_{14}$." Our subsequent experiments have considerably strengthened us in this view. We have now obtained a sample of the hydrocarbon from cholesterol in a state appreciably purer than Diels' original sample; our new sample has m.p. 131—133° (after sintering at 129°), whereas our pure synthetic 1 : 2-*cyclo*pentenophenanthrene has m.p. 135°, (in our previous communication this m.p. was given erroneously as 152—153°, although the m.p.s of the two derivatives were given correctly.) A full account of our synthetic experiments has recently been submitted to the Chemical Society for publication.

I am, Sir, etc.,
J. W. COOK

London, S.W.3
July 14, 1933

PERSONAL AND OTHER ITEMS

We greatly regret to learn of the death in Australia of a very old member of the Society, Mr. E. Mayhew, registrar of the Pharmaceutical Council of Western Australia. Mr. Mayhew joined the Society in 1885. He was for some years a lecturer at the Perth Technical College.

Mr. Maurice F. G. Wilson, M.Inst.C.E., who has been chairman of the Main Committee and chairman of the General Council of the British Standards Institution in all for the past five years, has retired in accordance with the bye-laws, and Mr. E. J. Elford, M.Inst.C.E., Borough Engineer and Surveyor of Wandsworth, past-president of the Institution of Municipal and County Engineers,

and chairman of the Building Divisional Council, has been unanimously elected to succeed him as chairman of the General Council for the next 12 months.

Mr. Horace Broadbent, chairman and managing director of Thos. Broadbent & Sons, Ltd., the well-known engineering concern at Huddersfield, recently commemorated his 70th birthday and the completion of 55 years' service with the company. The occasion was marked by the presentation by fellow-directors of a souvenir album portraying the history of the firm since its commencement in 1864, and the staff presented a silver salver suitably inscribed.

The American Cyanamid Co. has appointed Mr. G. M. J. Mackay director of research for the subsidiary companies in its cyanamid group. Mr. Mackay worked at one time at the Massachusetts Institute of Technology under Dr. A. A. Noyes. He was appointed research assistant to Dr. Irving Langmuir in 1910, and is at present in charge of research and development work in the insulation section of the General Electrical Co.'s laboratories at Schenectady.

Mr. M. G. Evans, assistant lecturer in chemistry in the University of Manchester, has been granted a year's leave of absence to enable him to take up a Rockefeller Fellowship.

The University of Sheffield has appointed Mr. R. Ibbotson demonstrator in non-ferrous metallurgy, and Mr. R. F. R. Sykes junior research assistant in glass technology.

The Chemical Society

Owing to the re-wiring of the electric light installation by H.M. Office of Works, it has been found necessary to extend the closing of the Library by one week. The Library will be closed, therefore, from August 7 to 26 inclusive.

Beit Fellowships for Medical Research

Amongst those who have been awarded Junior Fellowships (value £400 per annum) by the Trustees of the Beit Memorial Fellowships for Medical Research are the following: A. S. McFarlane, M.B., M.A., who will work at Upsala University, Sweden, on the physico-chemical nature of protein solutions and of suspensions of bacteria by measurement of the light-scattering capacity and of the sedimentation velocity in the field of the ultra-centrifuge; W. J. Dann, Ph.D., who will work at the Nutritional Laboratory, Cambridge, on the transmission of food vitamins by milk and the placenta, and the possible function of ascorbic acid in oxidation mechanisms of the cell; M. Stacey, Ph.D., who will work at the London School of Tropical Hygiene on the carbohydrates yielded in growth of moulds and bacteria; and P. J. G. Mann, B.Sc., who will work in the University of Cambridge on the action of vitamin-B as a possible co-enzyme of the lactic dehydrogenase system.

Official Opening of New Chemical Works

The new factory of Boots Pure Drug Co., Ltd., at Beeston, Nottingham, is to be officially opened on July 27, the fiftieth anniversary of the commencement of the company. In 1883 the company was started with one small shop. It has now 991 branches, and the new factory is remarkable for its modern construction, the walls and roof being built of glass. A visit to the works on the occasion of the annual meeting of the Society in 1932 in Nottingham was described in the JOURNAL of July 29, 1932.

Chemical Works Fire

The chemical works of Forbes, Abbott & Lennard, Ltd. was completely gutted in a disastrous fire in the district of Old Ford Road, Bow, East London, on July 12. The fire is believed to have started in a tank of anthracene, and the whole factory was very soon in flames. An adjoining timber yard became involved, and the neighbouring works of Bryant & May, Ltd., match manufacturers, and Carless, Capel & Leonard, Ltd. petrol and naphtha refiners, were threatened, but after six hours' work the fire was brought under control. The total damage has been estimated at £150,000.

Oversea Scholarships

Included in the names of those who have been awarded Oversea Scholarships by the Royal Commission for the Exhibition of 1851 are Mr. J. J. Rae, M.A., of Toronto University, who will undertake research work in bio-chemistry at the Lister Institute, London, and Mr. J. E. Vanderplank, M.Sc., who will work on mycology, plant physiology, and plant chemistry at an institute in Europe.

Chance Sand-Flotation Process

The first commercial installation in England of the Chance sand-flotation process of cleaning coal is now operating at the colliery of J. & J. Charlesworth, near Wakefield. The process is gravitational, the medium being a mixture of sand and water kept agitated, the density of the mixture being controlled by varying the amount of water. About 40,000,000 tons of coal are treated annually by the process in America.

Radium Research

An important development of facilities in this country for research on massive radiation is indicated in the announcement in the medical journals that the Union Minière du Haut-Katanga is to lend at least five grammes of radium to this country. Research with this radium unit is to be organized by a body composed of Sir Frederick Gowland Hopkins, P.R.S., Lord Dawson, Sir Holburt Waring, Mr. Wilfred Trotter, Sir George Blacker, Lord Rutherford, and Prof. Arthur Hall. The unit may be increased at a later date to 10 g., and the period provisionally fixed for the loan is two years.

British Standard Specification

The British Standards Institution has issued a revised edition of the B.S. Specification for Insulating Oils. No changes are made as regards physical properties of the oil, but an endeavour has been made to incorporate a criterion of "freedom from moisture." This is the "crackle test," and whilst it is of a somewhat unscientific nature, it is hoped that its use, which is optional, will enable a more scientific technique to be evolved in future. Copies of this specification (B.S.S. No. 148—1933) may be obtained from the British Standards Institution, Publications Department, 28, Victoria Street, London, S.W.1, price 2s. 2d. post free.

REVIEWS

..TIONS SUPERFICIELLES FLUIDES À DEUX DIMENSIONS ET STRATIFICATIONS MONOMOLÉCULAIRES. By A. Marcelin. Recueil des Conférences-Rapports de Documentation, sur la Physique. Pp. 163. 30 fr. Paris: Les Presses Universitaires de France, 1931.

I. Marcelin, who has devoted many years to the study surface films, especially of monomolecular films on er, gives in this book a very lucid and readable osition of some portions of the theory of the subject, of the experimental technique. His chapter on the isurement of surface pressure is one of the best ounts of the various instruments that has yet eared. Insoluble films, on water and mercury, are ited in much detail; the properties of soluble aded films, the effect of surface films on the ease of ting of solid surfaces, soap films, and thin stratified stals also receive attention. The book is delightfully rly written and is well printed.

.s an account of the important contributions of his ipatriots to knowledge of these extremely interesting s, this book is very welcome, but as a monograph scarcely adequate. Some of the work done in other ntries is described, but no mention is made of the oortant work of Frumkin, Katz, Rideal, or Zocher. section on surface potentials ends with Guyot's k, and, perhaps through neglecting to avail himself the results of ultramicroscopic examination of the s, the author's theories seem in places to confuse lution " with " collapse " of the films under pressure. distinction between " molecular varnishes " and ue surface solutions " in chapter VII is not con-ing. The author does not seem to have sufficiently ized the great importance to chemistry of these films, relation between their properties and the shapes, hanical properties, and adhesional fields of force of molecules being treated only in a very elementary ; one would scarcely guess from this book how useful ol these films are becoming in chemical investigations. levertheless the work of the French investigators is uch importance that serious students will be grateful this excellent account. Those also who desire a clear oduction to the elementary ideas of the subject, ether with a description of many ingenious experi-its suitable for lecture demonstration, will find here it they need.

N. K. A.

: CHEMIE-INGENIEUR. Edited by A. Eucken and M. Jakob. Vol. I. Part 1. Hydrodynamische Materialbewegung: Wärmeschutz und Wärmeaustausch. By M. Jakob and S. Erk. Pp. xix - 539. Leipzig: Akademische Verlagsges., 1933. Paper, 52 m.; bound, 54 m.

his volume forms a part of the larger work mentioned he title but is in itself a complete book on fluid flow heat transfer. There is adequate justification for ting these two subjects together in the importance the principle of similarity and the boundary-film ory in both cases.

hapter I deals with the general principles of fluid in pipes. In the first few pages the Eulerian ations of motion for three-dimensional flow of a non-viscous fluid are introduced in order to derive Bernoulli's equation. The derivation of Bernoulli's equation from energy considerations is decidedly simpler. The method adopted is likely to deter at the start the average reader with only moderate mathematical knowledge. Chapter II deals with the viscosity of fluids. A description is given of methods for determining viscosity, and the influence of pressure and temperature on viscosity is discussed. A useful collection of data relating to the viscosity of fluids is given. Chapter III deals with frictional loss in fluid flow through pipes, bends, valves, elbows, etc. Chapter IV gives a brief description of the principles of pneumatic conveying.

Chapter V gives a very complete treatment of the principles of heat transfer, extensive use being made of the principle of similarity. Chapter VI deals with properties of materials which influence heat transfer, such as conductivity and emissivity. A very complete collection of data relating to conductivities of various materials has been brought together here. Chapter VII deals with heat insulation. Chapter VIII is essentially an application of the principles described in Chapter V to a number of special cases of heat transfer, its title, "Measures which promote Heat Exchange," being somewhat misleading.

The book as a whole forms a valuable work of reference and brings together in convenient form a large amount of recent work. The references to German work appear very complete, but omissions of some relevant American work may be noted. The book is excellently produced, apart from a somewhat unattractive cover, but its high price (nearly £4 at the present rate of exchange) will severely restrict its appeal to English readers.

A. J. V. UNDERWOOD

COMPANY NEWS

COURTAULDS, LTD.

The company has announced an interim dividend of $1\frac{1}{2}\%$ on the ordinary shares. The interim dividend last year was $1\frac{1}{4}\%$, and this was followed by a final dividend of $2\frac{3}{4}\%$, making a total of 4%. The ordinary capital of the company is £24,000,000, and the increased in dividend of $\frac{1}{4}\%$ amounts to £60,000. The dividend will be payable on August 12 to all shareholders on the books on July 13.

SANITAS CO., LTD.

The net profit of the company for the year ended March 31 was £68,904, as compared with £54,434 in the previous year. Interim dividends on the ordinary shares total $37\frac{1}{2}\%$, as against 33% last year. The directors propose to create a contingency reserve of £10,000.

ELECTRO CHEMICAL PROCESSES, LTD.

The report of the company for the year ended March 31 records a net loss of £10,065, increasing the debit balance to £99,594. Last year there was a loss of £29,521, and in the preceding 15 months a loss of £38,454. The electro deposition and plating business is now showing increased turnover and in the past few months there has been considerably increased activity in the colloidal products department.

MARKET REPORT

This Market Report is compiled from special information received from the manufacturers concerned.

Unless otherwise stated, the prices quoted below cover fair quantities net and naked at sellers' works.

The following alterations in prices are reported since the publication of the last Market Report (cf. CHEM. & IND., July 7, 1933, p. 569).

GENERAL HEAVY CHEMICALS

Acid, Hydrochloric.—Spot, 4s.—6s. per carboy d/d according to purity, strength, and locality.

TAR PRODUCTS

Xylol.—2s.—2s. 1d. per gal. Pure, 2s. 3d.

PERFUMERY CHEMICALS

Eugenol.—7s. 3d. per lb. Geraniol (*Palmarosa*).—17s. per lb. Geraniol.—6s. 6d.—11s. per lb. Heliotropine.—6s. per lb. Iso Eugenol.—8s. 6d. per lb. Linalol.—(*ex Bois de Rose*) 6s. 3d. per lb.—(*ex Shui Oil*) 5s. 6d. per lb. Linalyl Acetate.—(*ex Bois de Rose*) 7s. 6d. per lb.—(*ex Shui Oil*) 6s. 6d. per lb.

ESSENTIAL OILS

Almond.—Foreign S.P.A., 9s. per lb. Anise.—2s. 1d. per lb. Araucaria, 8s. 6d. per lb.—Bergamot.—6s. 6d. per lb. Bourbon Geranium.—24s. 9d. per lb.

Camphor.—Brown, 70s. per cwt.—White, 75s. per cwt. Cananga, Java, 10s. per lb. Cinnamon Oil.—3s. 6d. per lb. Cassia, 80/85%, 4s. 6d. per lb.

Eucalyptus, Australian B.P., 70/75%.—1s. 2d. per lb. Huon Pine (Methyleugenol, 95%), 16s. per gal. Lavender.—Mont Blanc, 38/40%.—10s. per lb. *Lemon.—4s. 6d. per lb. Lemongrass.—3s. 5d. per lb.* Orange, Sweet.—6s. 6d. per lb. *Otto of Rose.*—Anatolian, 37s. 6d. per oz.; Bulgarian, 55s. per oz. Palma Rosa, 8s. per lb.

Peppermint.—Japanese, 6s. 6d. per lb. Wayne County, 14s. 3d. per lb. Petitgrain.—4s. 9d. per lb.

PATENT LIST

The following is a list of complete specifications of chemical interest which are open for inspection under Section 91 (4) (a) of the Patent Acts. Printed copies are not available, but photographic copies may be obtained at a charge of 3d. per page (minimum 1s.) from the Patent Office, Chancery Lane, W.C.2.

I. 35,964 (1932). Philips' Gloeilampenfabr. Washing dust particles from gases.

36,717 (1932). Künkele. Influencing combustion in the hearths of shaft furnaces.

37,011 (1932). Comp. de Prod. Chim. et Electrométallurg. Alais, Froges et Camargue. Crystallizers.

II. 34,797 (1932). Standard Oil Development Co. Manufacture of pour point depressants for use with lubricating oils.

35,993 (1932). Perucca. Transforming oils and greases into high-grade lubricants.

36,717 (1932). Künkele. *See* I.

36,923—4 (1932). Hellmann. Furnaces for distilling or coking fuel.

III. 29,998 (1932). Henkel & Co. Manufacture of high molecular oxygen and thio ethers.

32,126 (1932). Standard Oil Development Co. Compositions comprising hydroformed solvents.

36,785 (1932). I. G. Farbenind. Manufacture of the tetrasulphuric acid ester of leuco-1 : 2 : 2′ : 1′-anthraquinoneazine.

86 (1933). Imperial Chem. Ind. Catalytic production of alcohols and alcoholic derivatives.

IV. 15,987 (1932). Soc. Chem. Ind. in Basle. Dyestuffs and their application.

36,785 (1932). I. G. Farbenind. *See* III.

V. 35,201 (1932). Weberei Ebnat and Textilwerk Horn. Producing paper-like sheets of fibrous material.

VI. 15,987 (1932). Soc. Chem. Ind. in Basle. *See* IV.

VII. 36,941 (1932). Caro and Frank. Production of highly-concentrated nitric acid.

IX. 36,795 (1932). Goldberg. Heat insulation.

X. 14,730 (1932). Thielmann. Manufacture of corrosion-resistant coatings on metal articles.

36,516 (1932). Soc. Oxythermique. Working fusion and reduction furnaces.

36,717 (1932). Künkele. *See* I.

XI. 35,524 (1932). Loewe. Producing high-emission thermionic cathodes.

XII. 27,936 (1932). Abbott Laboratories. Producing a natural fish oil of high therapeutic value.

XX. 27,936 (1932). Abbott Laboratories. *See* XII.

GENERAL NOTE

Official Trade Intelligence

The Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1, has received the following inquiries for British goods. British firms may obtain further information by applying to the Department and stating the specific number. *Austria:* Chemical products (50). *Barbados:* Soap (38). *Belgium:* Special metals and alloys (51). *Brazil:* Linseed oil, caustic soda and chemical products (58); iron and steel products (59); exporters of industrial chemicals (60); paint, varnish (61). *Canada:* Chemicals (41); iron and steel (43).

PUBLICATIONS RECEIVED

TECHNOLOGIE DE L'IMPRIMERIE. Pp. 29. Paris: *Cahiers Mensuels de Diffusion de l'Office Technique de l'Imprimerie*, 1933. 5 fr.

ANALYSIS OF OIL FOR THE PRODUCTION OF LUBRICANTS. By A. A. Ashworth, M.A. Pp. 63. London: E. Benn. Ltd., 1933. 9s.

REPORT OF THE GOVERNMENT CHEMIST OF THE WELLCOME TROPICAL RESEARCH LABORATORIES, KHARTOUM, FOR THE YEAR 1932. Chemical Section. Publication No. 66. Pp. 14. Sudan: Sudan Government.

GRUNDLAGEN DER PHOTOCHEMIE. By Dr. K. F. Bonhoeffer and Dr. P. Harteck. DIE CHEMISCHE REAKTION. Edited by H. Mark and M. Polanyi. Pp. vi + 295. Dresden and Leipzig: T. Steinkopff, 1933. Paper, 24 rm.; bound, 25 rm.

WATER POLLUTION RESEARCH. SUMMARY OF CURRENT LITERATURE. Vol. VI, No. 7. July, 1933. Abstracts Nos. 761—898. Department of Scientific and Industrial Research. Pp. 217—252. London: H.M. Stationery Office, 1933. 2s.

PRACTICAL KILN-DRYING. By W [illegible] M.A. Department of Scientific and Industrial Research. Forest Products Research. Special Report No. 3. Pp. iv + 23. London: H.M. Stationery Office, 1933. 1s. 6d.